Regional Operational Plan No. ROP.SF.2A.2022.26

Operational Plan: Inriver Netting Pilot Study and Extended Fish Wheel Sampling at the River Mile 19 Kenai River Sonar Site, 2022

by

Robert Begich

and

Dawn Wilburn

June 2022

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	′
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	″
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN NO. ROP.SF.2A.2022.26

OPERATIONAL PLAN: INRIVER NETTING PILOT STUDY AND EXTENDED FISH WHEEL SAMPLING AT THE RIVER MILE 19 KENAI RIVER SONAR SITE, 2022

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June 2022

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SIGNATURE PAGE

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Period Covered:	August 2022–December 2022
Field Dates:	August 2022
Plan Type:	Category II

Approval

Title	Name	Signature	Date
Area Research Supervisor	Robert Begich		
Project Biologist	Tony Eskelin		
Biometrician	Jiaqi Huang		
Biometrician	Xinxian Zhang		
Regional Research Supervisor	Tim McKinley		
Regional Research Supervisor	Jack Erickson		
Area Sonar Biologist	Dawn Wilburn		

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ABSTRACT

This project will continue to evaluate the efficacy of using drift gillnets at river mile (RM) 19 on the Kenai River in Upper Cook Inlet as an additional tool to apportion sonar estimates of migrating salmonids to individual species, especially sockeye salmon (*Oncorhynchus nerka*) and pink salmon (*O. gorbuscha*). Sonar estimates at RM 19 are currently apportioned via fish wheels located on each riverbank. Gillnets and extended fish wheel sampling time may provide additional information about the spatial and temporal distributions of these two species in the ensonified area of the river. In addition, estimating the proportions of these species in 3 drift gillnet mesh sizes will guide the development of future experimental designs to evaluate apportionment beginning in early August when large numbers of pink salmon may be passing the RM 19 sonar site simultaneously with late-run sockeye salmon.

Keywords: Kenai River, DIDSON, sockeye salmon, *Oncorhynchus nerka*, pink salmon, *Oncorhynchus gorbuscha*, apportionment, gillnet, Kenai RM 19 sonar, Upper Cook Inlet

INTRODUCTION

PURPOSE

DIDSON (dual-frequency identification sonar) is used annually to estimate the number of sockeye salmon (*Oncorhynchus nerka*) passing river mile (RM) 19 on the Kenai River of Upper Cook Inlet (UCI), Alaska (Figure 1). Sonar passage estimates of salmon are apportioned by species using daily fish wheel catches. The Division of Commercial Fisheries uses these estimates for forecasts and inseason management of Upper Cook Inlet commercial salmon fisheries (Glick and Faulkner 2019). The Division of Sport Fish also uses these estimates to manage the inriver sport fishery to achieve the late-run sockeye salmon escapement goal. An accurate apportionment of sockeye salmon is necessary to achieve these goals. The purpose of this study is to evaluate the performance of gillnetting, as well as fish wheel methods, for determining the spatial and temporal distribution of salmon species in the Kenai River during August at RM 19. Gillnetting data will not be used to apportion salmon species. Rather, the methods will be compared and if differences are detected, it will be necessary to determine why they exist and whether they impact the assessment of sockeye salmon. The drift gillnetting pilot study was conducted at RM 19 in 2021 and will continue in 2022.

BACKGROUND

The Kenai River drainage in western Kenai Peninsula is approximately 5,200 km^2 and is the major sockeye salmon producing watershed in Cook Inlet (Figure 1). The Kenai River also produces significant runs of coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), and Chinook salmon (*O. tshawytscha*). The Division of Commercial Fisheries long-standing comprehensive sockeye salmon stock assessment program drives the implementation of the *Kenai River Late-Run Sockeye Salmon Management Plan 5AAC 21.360.* This management plan relies on the RM 19 DIDSON to formulate sockeye salmon abundance estimates for the inriver run and serves as the basis for the spawning escapement estimates.

Fish wheels are operated at RM 19 to achieve 2 primary objectives: collect age, sex, and length (ASL) information on sockeye salmon and apportion passage estimates by salmon species. Information regarding ASL sampling methods can be found in Wilburn et al. (2021). This operational plan will discuss the other objective, species apportionment.

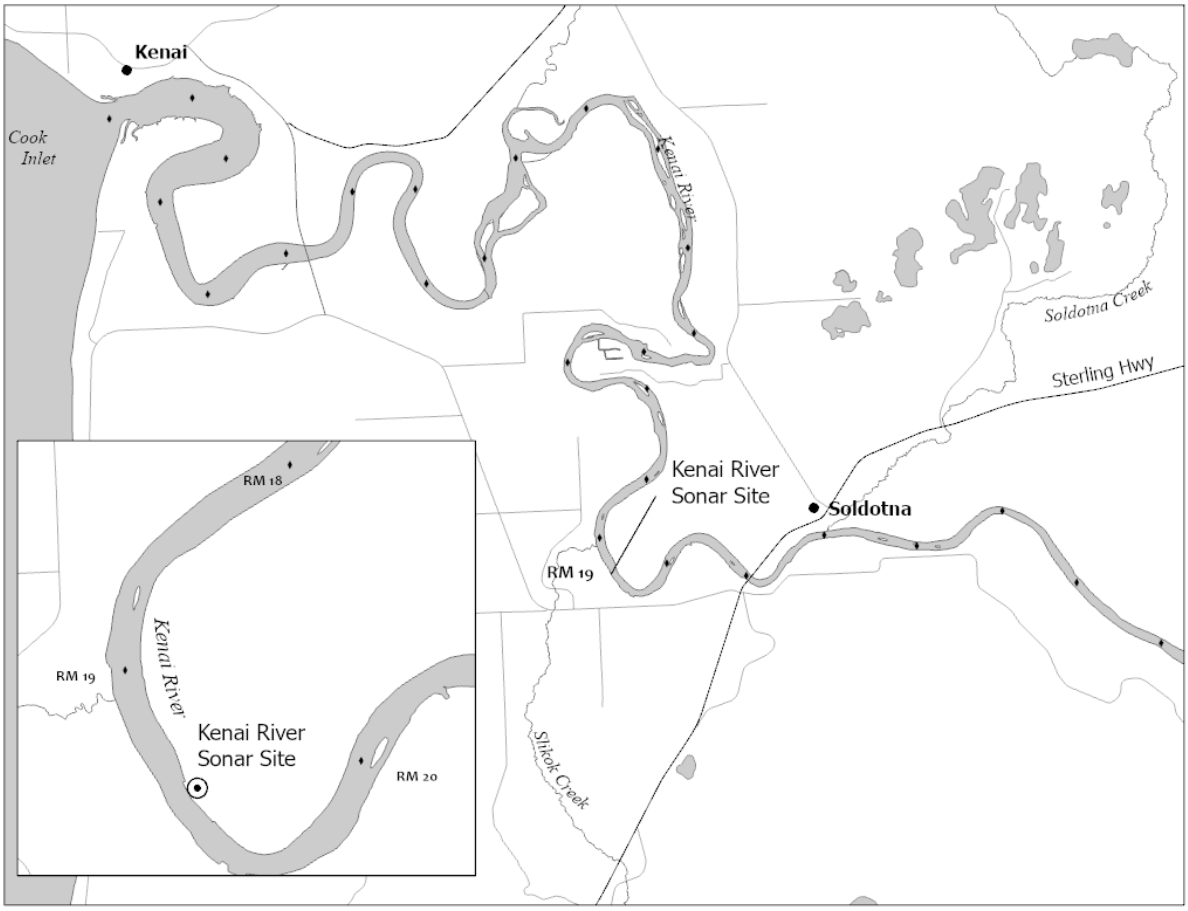

Figure 1.–Map showing the location of the Division of Commercial Fisheries sonar site at Kenai River RM 19.

Historically, species apportionment was not considered a significant source of error in Kenai River sockeye salmon passage estimates. Prior to 2020, sonar estimates were typically apportioned to species in years when fish wheel catches of other salmon species (pink and coho salmon) reached 5% of the daily catches. Mark–recapture studies conducted in 2006–2008 indicated that apportioned DIDSON passage estimates calculated from the north bank fish wheel were relatively unbiased and precise (Willette et al. 2012). During several recent years, sockeye salmon passage at the sonar site has been later than previously recorded. For example, during 2014–2015 and 2017–2018 the midpoints of the total sockeye salmon passage for the season ranged from 6 to 11 days late compared to the historical midpoint. In 2020 and 2021, the midpoints were approximately 14 and 12 days late, respectively (Glick and Marston *In prep*). The later timing of the sockeye salmon migration into the Kenai River has resulted in a greater overlap of sockeye salmon and pink salmon at the RM 19 sonar site during August, especially during even-year dominant pink salmon runs. These recent run characteristics warrant additional investigations into species apportionment methods at the sonar site.

ADF&G has validated the north bank fish wheel as a valuable apportionment tool (Glick and Willette 2016). In 2021, a pilot study at RM 19 determined the feasibility of using drift gillnets to

capture Pacific salmon migrating past the sonar site (Begich et al. *In prep*). Additionally, a second fish wheel was installed on the south bank and both north and south fish wheels were operated to obtain ASL samples and data for species apportionment. For species apportionment, sonar estimates by bank were apportioned using the bank's respective fish wheel catches. The 2021 drift gillnetting findings aided in developing drift gillnetting methods, identified set zones, data collection, and staffing needs for future projects (Begich et al. *In prep*). The primary objectives were to estimate the proportions of sockeye salmon caught in gillnets in the nearshore zones, downstream of each fish wheel (fish wheel zones), and in offshore areas sampled by the sonar (sonar zones). Secondary objectives included determining the feasibility of designing future projects to assess species composition from drift gillnets of 3 mesh sizes.

The 2022 Kenai River fish wheels will continue to be operated primarily to collect ASL and species apportionment data. Fish wheel operations, sampling objectives, and daily sampling goals for the fish wheels can be found in Glick et al. (*In prep*). Glick (*In prep*) provides a detailed history of fish wheel operations at the RM 19 sonar project.

OBJECTIVES

The objectives of the second phase of this project are based on the results from 2021 and will examine the species compositions of netting in offshore sonar zones and fish wheel zones in August. Species composition of fish wheel catches by temporal strata within a day will also be examined throughout August. In addition to the spatial characteristics of salmon migration by sockeye and pink salmon, species compositions among various gillnet mesh sizes are also of interest. These data will help to build understanding about efficient capture methods and spatial characteristics of the salmon migration at RM 19. The 2022 objectives are as follows:

PRIMARY OBJECTIVES

1) Estimate the proportion of sockeye salmon and pink salmon, by sample day, captured in gillnets from the south and north bank "fish wheel zones" at RM 19 such that the proportion estimates are within 15 percentage points of the true value 95% of the time.
2) Estimate the proportion of sockeye salmon and pink salmon, by sample day, captured in gillnets from the nearshore, midshore, and offshore "sonar zones" of the south and north banks at RM 19 such that the proportion estimates are within 15 percentage points of the true value 95% of the time.
3) Estimate and compare daily proportions, by each bank, of sockeye salmon and pink salmon captured using gillnets in the fish wheel (sets 1 and 2) and 0–10 m sonar zones (sets 3 and 8) vs. those captured in fish wheels at RM 19 in August.
4) Estimate and compare the proportion of sockeye salmon captured with fish wheels between temporal strata within a day for 10 days in August.

SECONDARY OBJECTIVES

1) Estimate the daily proportion of sockeye salmon and pink salmon captured from all the south bank sonar and fish wheel zones in each drift gillnet of 3 mesh sizes (10.2 cm [4.0 inch], 12.1 cm [4.75 inch], and 12.7 [5.0 inch]).

2) Estimate the daily proportion of sockeye salmon and pink salmon captured from all the north bank sonar and fish wheel zones in each drift gillnet of 3 mesh sizes (10.2 cm [4.0 inch], 12.1 cm [4.75 inch], and 12.7 [5.0 inch]).

METHODS

NETTING STUDY DESIGN

Drift gillnets will be used to capture migrating salmon passing the RM 19 sonar site from August 1 to the completion of the sonar project for the season. The 2022 project is planned to extend from August 1 through 24. The proportion of each species caught in the gillnets will be estimated for each zone fished as well as by mesh size. These drift gillnets, each 10 m long, will consist of a single mesh size—either 12 cm (4.75-inch, "medium"), 10 cm (4.0-inch, "small"), or 12.7 cm (5.0-inch, "large") mesh—and each gillnet will be fished as part of a replicate that alternates mesh sizes and zones as described below in *Data Collection*.

Netting Schedule and Area

Netting will be conducted every other day for the duration of the project. The netting crew will be composed of a minimum of 3 fishery technicians, working a shift schedule with different sampling hours each day. Each technician will be scheduled 3 days per week for 9.5 hours per day of which approximately 8 hours will be spent netting. The remainder of the time will be for travel to and from the work site, required maintenance, and a 0.5-hour lunch break. The gillnet schedule is outlined in Appendix A1 and may be modified inseason due to equipment issues and sonar operations (e.g., closing of sonar project earlier than anticipated).

Each gillnet will be fished with equal frequency in 4 different zones on each bank: 1 nearshore "fish wheel zone" and 3 "sonar zones." Each fish wheel zone is defined as the nearshore area immediately downstream of each fish wheel from the riverbank out to approximately 10 m toward the thalweg. The 3 sonar zones will consist of a nearshore (0–10 m), midshore (10–20 m), and offshore (20–30 m) areas that will collectively span from the bank near the sonar pod to 30 m toward the thalweg of the river channel. For the sonar zones, netting will consist of 3 contiguous 10 m long sets (nearshore at 0–10 m, midshore at 10–20 m, and offshore at 20–30 m; Figure 2). Rangefinders will be used to ensure the net is approximately within the specified cross-sectional area, and depth sounders may be used to ensure river depths do not exceed gillnet depth. During the 2021 experimental drift gillnetting, depth sounder measurements in the sonar zones showed depths did not exceed net depth. Similar circumstances are expected in 2022, however annual variability in riverine conditions (depth, discharge, and nearshore obstacles such as fallen trees) will be assessed again in 2022 to ensure all zones can be fished similarly. Effort will be made to ensure each set is within the predetermined area. In practice, the fish wheel and sonar zones on each riverbank have different substrate profiles, depth, and discharge characteristics such that the north bank zones may require little effort to maintain a proper set whereas other zones, particularly south bank zones, could require increased effort because of problematic areas (snags, rocks, fishing docks). The goal will be for crews to net each area equally to the extent practical.

Nets will be deployed perpendicular to each bank and a set will be terminated if any of the following occur: 1) the net becomes snagged on the bottom or is not fishing properly, 2) the net is not fishing in the appropriate area, 3) the set area or zone has been completely fished by the gillnet,

or 4) the net is saturated with salmon (usually greater than 10 fish, noticeable by submerging cork lines and surfacing fish).

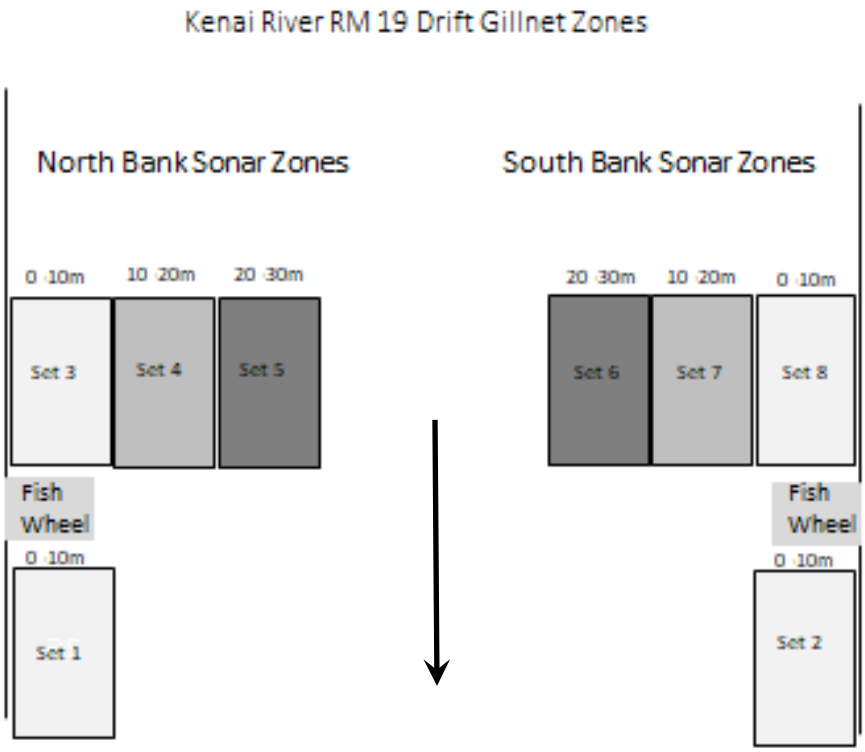

Figure 2.–Schematic diagram of the locations of drift gillnetting zones at the RM 19 Kenai River sonar site, 2022.

Data Collection

Because multiple sets will occur on each side of the river, the crew will collect data in sampling replicates (Figure 2). Each sampling replicate will consist of 8 sets with the same mesh size. Sets 1 and 2 will be in the fish wheel zone on each bank. The next sets (3–8) will be from each bank starting near the sonar pod extending outward to 30 m to cover the sonar zones (Figure 2). For example, netting at the north bank will start at the nearshore fish wheel zone, then move to the south bank nearshore fish wheel zone for the second set. Sets 3–5 will move back to the north shore sonar zones which will be followed by sets 6–8 at the south bank sonar zone. Each replicate will be fished with a gillnet consisting of a single mesh size. That is, on the first replicate, technicians will fish 8 sets with a gillnet of one size and then they will change to a different gillnet mesh size and fish the 8 sets in the same order again. The first replicate of each day will begin with a different net mesh size in order of ascending mesh size. For instance, on day 1, the small mesh will be employed for the first replicate followed by the medium and large mesh sizes, and on day 2, the medium mesh size will be employed for the first replicate followed by the large and then small mesh sizes in order. Each sampling day will end after an 8-drift replicate is completed. As many complete replicates will be completed as time allows each sampling day. Based on 2021 gillnet catches, the highest catch rates are anticipated in the fish wheel and nearshore sonar zones. Mid- and offshore sonar zones (10 m to 30 m) had lower catches, particularly on the south bank (Begich et. al *In prep*). Because a high abundance of fish is expected due to an even-year dominant

pink salmon run, all areas will be netted equally to examine species distribution as distance from shore increases.

Primary responsibilities of the netting crew will be to set nets in the specified areas and to record set location (south or north bank), set start and stop times, and number of fish caught by species. The start time will be recorded as the time the crew begins setting the net and the stop time will be recorded as the time the crew begins pulling the net. All data will be recorded electronically using data entry software on a Juniper Systems Inc. Allegro II field computer. After sampling, the crew will download the data onto a desktop computer. If the field computer is not functioning properly, data will be recorded on a data form (Appendix B1). In addition, crews will fill out a field notebook daily to document observations not covered by the electronic data entry system such as issues with boat traffic, interactions with the public at the netting site, and extent of downstream distance travelled after pulling the net (during high catches, the boat may drift 0.5 RM or more downstream as fish are removed from the net). Excessive downstream drifting can reduce the number of replicates completed in a day. To attain the desired precision for estimating proportions of sockeye and pink salmon stated in the objectives, at least 43 fish need to be sampled from each zone or 172 fish from each bank for a total of 344 fish each day, if the 43-fish sample size is equally distributed among all 8 zones (Thompson 1987).

FISH WHEEL SAMPLING AND DATA COLLECTION

The primary objective of the fish wheel operation at RM 19 is to collect ASL data and species apportionment information on daily salmon passage. To achieve the objectives listed in Glick et al. (*In prep*), the daily ASL sample goal from fish wheel catches is a total of 100 fish (n = 100) between the two fish wheels. The daily proportion of each salmon species captured in each bank's respective fish wheel will be multiplied by the sonar fish passage estimates for each bank to apportion the count. The estimates for each bank are then summed for a daily estimate.

After the crew has turned on the fish wheels for the day, they will monitor fish passage through the fish wheel and record fish numbers by species. If fish are going directly into the live box, technicians will periodically check to make sure the box is not inundated with fish. If it appears that too many fish are collecting in the box, the technician will shut off the fish wheel and dip the fish from the live box while recording the species of each fish. The fish wheel will then be turned back on to collect more fish while the live box is monitored periodically. Depending on passage rates, this may have to be done several times during a sampling stratum.

In the past, the amount of time fish wheels operated often depended on how quickly samples were collected for ASL data. Depending on the run strength, river conditions, and other variables, fish wheels have been operated for as little as 0.4 hours in a day to as much as 20 hours in a day during August (over the last 5-year period). Early in the month, the fish wheels tend to run longer, often starting around late morning, and as the month progresses, fish wheel operation time gets shorter so that by mid-August, they are often only operated for 2 hours or less in the evening. Time permitting, technicians have opportunistically operated the fish wheels to collect as many samples as possible throughout a day, and all salmon that passed through the fish wheels were used for daily species apportionment.

To meet Objective 3 in this project (gillnet vs. fish wheel proportions), unless there is a potential for gear interference when the netting crew is sampling in the fish wheel zones, all fish wheel salmon catches will continue to be included in the daily apportionment. If fish wheel operation and netting (in the fish wheel zones) occur simultaneously, fish wheel catches for that hour will

not be used for daily species apportionment. The fish wheel zone drift is immediately behind the fish wheel and may alter the behavior of fish or remove upstream migrating fish about to enter the fish wheels. Because the effects of the netting on the fish wheel catches are unknown, these data will be excluded. General details on fish wheel sampling methods can be found in Glick et al. (*In prep*).

Additional (extended) fish wheel operation time will allow us to test whether there are differences in the proportions of sockeye and pink salmon at fish wheels during different daily temporal strata (within a single day; Objective 4). A dedicated crew will monitor Kenai River fish wheels 3 days a week for 12 hours a day in August. Each sample day of 12 hours will be divided into 4 temporal sampling strata of 3 hours: 08:00–10:59, 11:00–13:59, 15:00–17:59, and 18:00–20:59. On sample days, technicians will continuously operate and physically monitor the fish wheels, recording the number and species of all fish that pass through the fish wheels during each time stratum. For the remaining days of the week and times outside of the extended fish wheel sampling strata, fish wheels will continue to be operated by the standard method used in the past for collecting ASL data.

Sampling for Objective 4 will occur for a total of 10 sample days through August 22. The crew will consist of 2 technicians per shift. When technicians arrive for their shift, they will check the live boxes on each fish wheel. If fish are present in the live boxes, technicians will need to contact the crew leader of the Upper Cook Inlet Catch and Escapement crew to determine how many ASL samples are to be collected for the commercial fisheries project. The crew will collect the samples needed, then count and identify by species any remaining fish that are dipped out of the boxes. Sampling protocol for ASL collection can be found in Wilburn et al. (2021). Once fish are sampled, crews will turn fish wheels back on for the remaining sampling strata in the day. The north and south bank fish wheels will run simultaneously as much as possible, with each monitored by a technician. This "extended" fish wheel sampling schedule can be found in Appendix A1. Sampling strata were designed to cover potential diel changes based on observations of fish movement from sonar passage during recent years.

DATA REDUCTION

The gillnet crew will return to the Soldotna office following each sampling shift and be responsible for entering data into the field computer and downloading data to the project biologist's desktop computer, which will output the datasets into a comma separated text (.txt) format for analysis.

The project biologist will review the netting data to vet the values of fish enumerated by species and to ensure that set and pull times are entered into the proper field within regular bounds. The project biologist will edit the data for obvious coding errors and then forward to staff conducting postseason data analyses. All data will be kept in a network-protected computer file, which will be edited and error-checked by appropriate staff for summaries and analysis.

The fish wheel crew will be responsible for recording data on daily log sheets and turning them in to the office located at the sonar site after each shift. If time allows, they will enter the data into Excel on a computer. The sonar project biologist will review the data to ensure it is accurate and complete and then forward to staff conducting postseason data analysis.

DATA ANALYSIS

Netting Proportions

The estimated daily proportion ($\hat{p}_{sbz}$) of sockeye or pink salmon *s* from zone *z* (fish wheel zone, nearshore, midshore, or offshore sonar zone) of bank *b* (north bank or south bank) will be calculated using the equation below:

$$\hat{p}_{sbz} = \frac{n_{sbz}}{n_{bz}} \tag{1}$$

where n_{bz} is the total number of fish sampled from zone *z* of bank *b*, and n_{sbz} is the number of sockeye salmon or pink salmon sampled from the same zone.

The variance of $\hat{p}_{sbz}$ will be calculated as follows (Cochran 1977):

$$\text{var}(\hat{p}_{sbz}) = \frac{\hat{p}_{sbz}(1 - \hat{p}_{sbz})}{(n_{bz} - 1)} \tag{2}$$

Objective Comparisons

Objective 3

A Chi-square statistic will be used to test whether daily fractions (by bank) of sockeye salmon captured in gillnet fish wheel zones differed from fractions captured in fish wheels. In each analysis, a contingency table will be constructed with daily sockeye salmon catches in one column and daily catches of other salmon in another column with a row for each gear type. If necessary, the data may be aggregated by week to achieve expected values >5 in each cell (Zar 1984).

Objective 4

A contingency table for each extended fish wheel sampling day will be constructed with daily sockeye salmon catches in one column and daily catches of other salmon in another column. There will be a row for each temporal stratum in a day. A Chi-square statistic will be used for the analyses.

SCHEDULE AND DELIVERABLES

Dates	Activity	Personnel
March	Prepare operational plan	SF, CF
July	Prepare equipment for the field work, program Allegro computers	SF, CF
August	Field season collect data	SF, CF
September	Prepare data for analysis and forward to RTS	SF, CF
October	Conduct data analysis	RTS
January 2023	Summarize findings in an RIR report	SF, CF

Note: SF = Division of Sport Fish staff; CF = Division of Commercial Fisheries staff; RTS = Division of Sport Fish, Research and Technical Services staff.

RESPONSIBILITIES

Project Leader
Robert Begich, Fishery Biologist III
Duties: Responsible for completing operational plan, ensuring project work is completed, preparing data for analysis, and making recommendations to regional biologists for future project work.

Consulting Biometrician
Jiaqi Huang, Biometrician IV
Duties: Provide guidance on sampling design, sample size criteria, and data analysis; assist with preparation of operational plan.

Xinxian Zhang, Biometrician III
Duties: Provide guidance on sampling design, sample size criteria, and data analysis; assist with preparation of operational plan.

Project Biologist Supervisors
Robert Begich, Fishery Biologist III and Tony Eskelin, Fishery Biologist II
Duties: Oversee the netting project and responsible for hiring, crew supervision, field season preparation, collection of data, data analysis, report writing, and operational planning.

Dawn Wilburn, Fishery Biologist III and Bill Glick, Fishery Biologist II
Oversee the sonar and fish wheel projects. Responsible for hiring and crew supervision, field season preparation, collection of data, data analysis, report writing and operational planning.

Netting Crew
2-Fish and Wildlife Technician III and 1-Fish and Wildlife Technician II (1 August–24 August)
Duties: Capturing and sampling salmon in nets, and recording data on handheld computers while adhering to strict sampling schedules and protocols. Further duties are preventative maintenance and repair of assigned equipment.

Fish Wheel Crew
2-Fish and Wildlife Technician II
Duties: Capturing and sampling salmon in fish wheels, recording data on forms while adhering to sampling schedules and protocols. Further duties include helping with maintenance and all operations involving fish wheels.

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APPENDIX A: SAMPLING SCHEDULE

Appendix A1.–Gillnet sampling schedule and fish wheel sampling methods (extended or standard) by day, August 2022.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1 Standard FW Prepare Gear: (08:00–16:30)	2 Extended FW Netting: (13:00–22:30)	3 Extended FW	4 Standard FW Netting: (11:00–20:30)	5 Extended FW	6 Standard FW Netting: (09:00–18:30)	7 Standard FW
8 Extended FW Netting: (13:00–22:30)	9 Standard FW	10 Extended FW Netting: (11:00–20:30)	11 Standard FW	12 Extended FW Netting: (09:00–18:30)	13 Standard FW	14 Standard FW Netting: (11:00–20:30)
15 Standard FW	16 Extended FW Netting: (09:00–18:30)	17 Extended FW	18 Extended FW Netting: (11:00–20:30)	19 Extended FW	20 Standard FW Netting: (13:00–22:30)	21 Standard FW
22 Extended FW Netting: (11:00–20:30)	23	24 Standard FW Netting: (09:00–18:30)	25 Standard FW Gear Storage: (08:00–16:30)	26	27	28

Note: Extended fish wheel sample strata will be from 08:00–10:59, 11:00–13:59, 15:00–17:59, and 18:00–20:59.

APPENDIX B: SAMPLING FORM

Appendix B1.–Kenai River RM 19 inriver netting sampling form.

KENAI RIVER RM19 NETTING FORM

Page_____of _____

Date:_____ Names:_____

Rep	Set	Bank	Loc	Mesh	Start Time	Stop Time	Species captured						Comments
							Sockeye	Pink	Coho	Chinook	RB	DV	

	Time	Secchi
Start		
End		

Rep: 8 sets, 1 set at each location off each bank **Set:** begin 1 each day **Bank:** Bouy thrown towards (N or S) **Loc:** Location, FAV= below fishwheel, NS=nearshore adjactent to sonar 0-10m offshore, M=mid 10-20m offshore and OFF=offshore 20-30m, **Mesh:** in inches (4.75, etc.) **Start time:** military to nearest sec. when bouy is thrown **Stop time:** military to nearest sec. when leads begin being pulled. **Comments:** any pertinent info. **Secch:** nearest 0.05 m